

REMARKS

Claims 23-34 and 38-51 are pending. Claims 23 and 37 have been combined and Claim 37 cancelled.

I. 35 USC § 103

A. Heymes et al.

Claims 23 and 26-51 stand rejected under 35 USC § 103(a) as allegedly being unpatentable over Heymes et al. (U.S. Patent No. 6,077,363). The Office Action asserts the reference expressly teaches each feature recited by the rejected claims, except for the semi-continuous casting method being DC casting. However, the Office Action continues, because "DC casting is conventional and well known," such a casting procedure is within the scope of Heymes et al.

1. The Mn-2Fe proviso of Heymes et al.

Amended Claim 23 permits at most incidental impurity levels of Mn. Thus, Applicant reiterates its argument that although present claim 23 theoretically allows the presence of 0% Fe, the reality is that some incidental or impurity level of Fe is always present in aluminum alloys. Typical low levels of Fe can be found in the present application disclosing 0.06%, or in Colvin (U.S. Patent No. 5,213,639), column 4, line 41 disclosing 0.07%, or US application 10/642,507 (US 2004/0099353) column 4, Table 1 disclosing about 0.06%. As a consequence in alloys where the Mn-content is in the range of incidental impurities, the Mn-2Fe proviso of Heymes et al. is more than very likely to be negative which is not allowed by Heymes et al.

In view of this Claims 50 and 51 further distinguish over Heynes et al. Claim 50 recites the amount of Fe in the alloy is 0.06-0.10%. Claim 51 recites the alloy comprises Fe.

2. Unexpected Results

The Office action asserts Applicant has not provided a clear nexus between the unexpected results and the prior art of record. Specifically, the Office action asserts Applicant has not provided evidence or arguments that 2024 or 2524 is closer prior art than the prior art of record. The following table compares the alloy composition information from Table 1 of the present application and the table at column 6 of Heymes et al.

Chemical composition of the alloys, in weight %, balance aluminum and inevitable impurities						
Alloy	Cu	Mn	Mg	Zr	Si	Fe
AA2024	4.4	0.59	1.51	0	0.05	0.06
AA2524	4.3	0.51	1.39	0	0.05	0.06
Present Claim 23 broad range*	3.6 - 4.9	substantially Mn free	1.0 - 1.8	≤ 0.15	0.10 - 0.40	≤ 0.10,
Invention alloy 1	4.4	0	1.68	0	0.25	0.06
Invention alloy 2	4.4	0	1.61	0	0.11	0.06
Heymes et al. broad range**	between 3.5 and 5.0	<0.55	between 1.0 and 2.0		<0.25	<0.25
Heymes et al. closest example A4***	4.32	0.37	1.29	0.001	0.08	0.15
*Cr: ≤ 0.15 % ** 0 < Mn-2Fe < 0.2 *** Cr 0.005 %, Zn 0.05 %, Ti 0.02 %; Applicants selected Heymes et al. A4 as the closest example because it has the lowest Mn level of the Heymes et al. examples. Heymes et al., col. 6, line 6 and col. 7, line 2, explains its examples were AA2024 alloys.						

The difference between Mn levels of AA2024 (of the table) and AA2024 (of Heymes et al. A4) is about 0.2 %. It is respectfully submitted this makes AA2024 and Heymes et al. A4 comparable such that comparing the present invention with AA2524 is a reasonable substitute for comparing it with Heymes et al. A4.

Thus, the data of Tables 2 and 3 of the present application is relevant to showing unexpected results over Heymes et al. Applicants compare alloys 1 and 2 of the present invention having 0% Mn to AA2024 and AA2524 alloys which have higher levels of Mn.

As asserted in response to a prior Office action, when the elemental ranges as recited by present claim 23 are selected and the alloy is processed in the order as recited, unexpected results are realized. Applicants direct the Examiner's attention to paragraphs [0070]-[0071], which state:

[0070] It has surprisingly been found that lower levels of manganese result in a high toughness and an improved fatigue crack growth resistance specifically in areas where the toughness and fatigue crack growth resistance under tensile load are critical. Surprisingly, the alloy of the instant invention in the T3 temper, more specifically in the T351 temper, has a significant improved toughness by lowering the amount of manganese. Furthermore, it has been found that by increasing the amount of Si it is possible to achieve strength levels comparable with strength levels of conventional AA2x24 alloys. Furthermore, it has been found that by increasing the Si content improved FCGR performance is obtained. The Si content is increased to levels above those used in current aerospace grade materials, viz. typically <0.10, and preferably <0.07 wt.%.

[0071] More specifically, it has been found that a reduction of the manganese level and by increasing the silicon level the fatigue crack growth resistance of the alloy could be enhanced by up to 90% compared to a conventional 2024 alloy and up to approximately 65% compared to a conventional 2024 alloy if the strength levels are maintained. In that case even the toughness was improved compared to the toughness of conventional 2024 alloys. By lowering the level of manganese toughness as well as fatigue crack growth resistance was increased wherein the strength levels decreased. By also increasing the level of silicon the strength level increased again without lowering the toughness to unacceptable levels.

(emphasis added)

Moreover, Table 3 of the present specification, shows 0% Mn and 0.11-0.25% Si, results in unexpectedly improved FCGR with high strength. As explained in paragraph [0102], Table 3 shows lowering Mn level improves lifetime as measured by FCGR and this improvement is more or less independent of Si-levels. Thus, while the Mn level is lowered, the Si level can be increased to increase strength as shown in Table 2 without harming FCGR. This simultaneous control of these two ingredients is highly beneficial to achieve high strength, long lifetime alloys that are very useful for aeronautical purposes.

B. Heymes et al. in view of Colvin

Claims 24 and 25 stand rejected under 35 USC § 103(a) as allegedly being unpatentable over Heymes et al. in view of Colvin. The Office Action asserts Heymes et al. teaches each feature of the rejected claims, except for annealing or reheating the hot rolled ingot and further hot rolling, for which purpose Colvin is cited.

However, it is respectfully submitted that Colvin fails to cure the deficiencies of Heymes et al. against base Claim 23, thus dependent claims 24 and 25 are also allowable.

Moreover, Colvin is concerned with series 2xxx alloys, having about 0.3 to 0.9% Mn (as recited by claims 1 and 70 therein). Hence the combination of the teachings of these references would actually lead one of ordinary skill in the art away from a process of manufacturing a product having Mn present only as an incidental element.

II. Conclusion

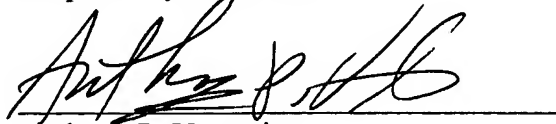
In view of the above, it is respectfully submitted that all objections and rejections are overcome. Thus, a Notice of Allowance is respectfully requested.

Date:

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By:

Respectfully submitted,



Anthony P. Venturino

Registration No. 31,674

APV/bms

ATTORNEY DOCKET NO. APV31645

STEVENS, DAVIS, MILLER & MOSHER, L.L.P.

1615 L Street, N.W., Suite 850

Washington, D.C. 20036

Tel: 202-785-0100 / Fax: 202-785-0200